

TESTIMONY OF LANCE R. GRENZEBACK

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on

FREIGHT BOTTLENECKS ON HIGHWAYS

before

**THE SUBCOMMITTEE ON HIGHWAYS, TRANSIT AND PIPELINES
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE
U.S. HOUSE OF REPRESENTATIVES**

Wednesday, May 10, 2006

Introduction

Mr. Chairman, distinguished committee members, my name is Lance Grenzeback. I am a senior vice president with Cambridge Systematics. We provide transportation policy, planning, and management consulting services to Federal, state, and local transportation agencies and to private-sector transportation and investment companies.

I am very pleased to appear before you to discuss freight bottlenecks on highways. In my remarks I will:

- Describe the findings of our recent work for the Federal Highway Administration (FHWA) on identifying and measuring the delays to trucks caused by major highway bottlenecks;
- Argue that the level of congestion on our freight network is becoming a significant problem; and
- Recommend that you consider a programmatic approach to reducing these bottlenecks.

Background

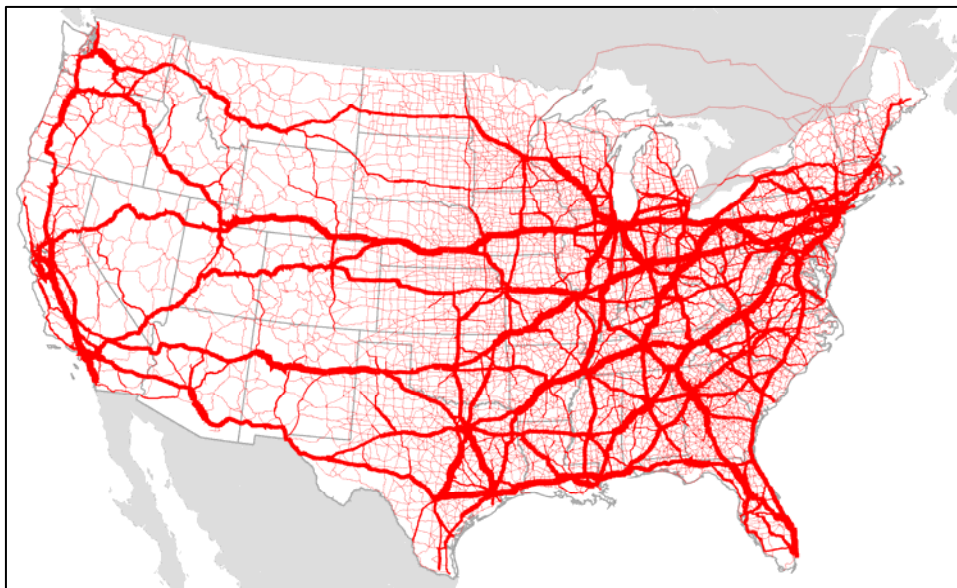
In the 1970s, transportation planners developed analytical methods and computer software to map and forecast traffic flows in metropolitan areas. They used these transportation models to plan new roads and transit services. As congestion increased through the 1980s and 1990s, the models were improved to identify bottlenecks, measure the cost of bottlenecks in driver-hours of delay, and test traffic management strategies as well as capital improvements. The information was used by the FHWA, state departments of

transportation (DOTs), and local governments to organize transportation programs, set priorities, and allocate funding among projects.

There was no parallel effort to analyze national freight flows until 1999, when the FHWA launched a program to map and forecast national freight flows. I was one of a small team of consultants working for the FHWA on this initiative. The program, called the Freight Analysis Framework (FAF), produced the first, comprehensive national maps and forecasts of freight flows by truck, rail, air, and water. Exhibit 1 is one of the early products of the program; it is a map showing the density of truck freight on the National Highway System.¹

What we found were increasingly congested highway and rail freight systems. In a follow-on study for the I-95 Corridor Coalition, we investigated rail bottlenecks in the *Mid-Atlantic Rail Operations Study*,² and then in the *Freight-Rail Bottom Line Report* commissioned by American Association of State Highway and Transportation Officials (AASHTO), we looked at the national implications of rail bottlenecks and the economic costs if the freight railroads could not keep pace with the growth in freight demand.³

Exhibit 1. Truck Freight Flows, 1998



Source: FHWA Freight Analysis Framework Program.

¹ See http://www.ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm.

² *Mid-Atlantic Rail Operations Study*, prepared by Cambridge Systematics, Inc. for the I-95 Corridor Coalition, April 2003. PDF copy available at <http://www.camsys.com/publi01.htm>.

³ *Freight-Rail Bottom Line Report*, prepared by Cambridge Systematics, Inc. for the American Association of State Highway and Transportation Officials, January 2003. PDF copy available at <http://www.camsys.com/publi01.htm>.

Freight Bottlenecks on Highways

In 2004, the FHWA asked if we could identify major truck bottlenecks on the highway system—specific physical locations on highways that routinely experience recurring congestion and traffic backups because traffic volumes exceed highway capacity—and estimate their economic cost.

My colleagues Richard Margiotta and Daniel Beagan developed a method to do this. It involved identifying congested highway sections by scanning the FHWA's voluminous Highway Performance Monitoring System database, estimating truck volumes using Freight Analysis Framework data and state traffic counts, and calculating truck-hours of delay using a simplified queuing model, called QSIM. The method is an advancement on an earlier effort to identify freeway bottlenecks for the American Highway Users Alliance.⁴

We located and estimated truck-hours of delay for 14 types of highway truck bottlenecks. Exhibit 2 lists the types of bottlenecks and the annual truck-hours of delay associated with each type. The bottleneck types are sorted in descending order of truck-hours of delay by the type of capacity constraint (e.g., interchange, steep grade, intersection, and lane drop). The individual bottlenecks in each category are unique and assigned to only one bottleneck type. Bottlenecks are not double counted across types.

The bottlenecks identified in our initial scan accrue 243 million hours of delay annually. At a delay cost of \$32.15 per hour, the conservative value used by the FHWA's Highway Economic Requirements System model for estimating national highway costs and benefits, the direct user cost of these bottlenecks is about \$7.8 billion per year.⁵ With better data and the next generation of analytical tools, we will undoubtedly find additional bottlenecks and the economic price tag will be greater.

Of the four major types of capacity constraints studied—interchanges, steep-grades, signalized-intersections, and lane-drops—interchange bottlenecks account for the most truck-hours of delay, estimated at about 124 million hours annually in 2004. The direct user cost associated with interchange bottlenecks is about \$4 billion per year.

Exhibit 3 shows the location of the highway interchange bottlenecks for trucks. The bottleneck locations are indicated by a solid dot. Most are urban Interstate interchanges. The size of the open circle accompanying each dot indicates the relative annual truck-hours of delay associated with the bottleneck.

⁴ Cambridge Systematics, Inc., *Unclogging America's Arteries: Effective Relief for Highway Bottlenecks, 1999-2004*, American Highway Users Alliance, Washington, D.C., February 2004.

⁵ The FHWA Highway Economic Requirements System model uses a current value of truck time of \$32.15 per hour. Other researchers have suggested higher rates, typically between \$60 and \$70 per hour.

Exhibit 2. Truck-Hours of Delay by Type of Highway Freight Bottleneck

| Bottleneck Type | | | National Annual Hof Delay, 2004 (Estimated) |
|-------------------------|----------|----------------------------|--|
| Constraint | Roadway | Freight Route | |
| Interchange | Freeway | Urban Freight Corridor | 123,895,000 |
| | | Subtotal | 123,895,000* |
| Steep Grade | Arterial | Intercity Freight Corridor | 40,647,000 |
| Steep Grade | Freeway | Intercity Freight Corridor | 23,260,000 |
| Steep Grade | Arterial | Urban Freight Corridor | 1,509,000 |
| Steep Grade | Arterial | Truck Access Route | 303,000 |
| | | Subtotal | 65,718,000‡ |
| Signalized Intersection | Arterial | Urban Freight Corridor | 24,977,000 |
| Signalized Intersection | Arterial | Intercity Freight Corridor | 11,148,000 |
| Signalized Intersection | Arterial | Truck Access Route | 6,521,000 |
| Signalized Intersection | Arterial | Intermodal Connector | 468,000 |
| | | Subtotal | 43,113,000‡ |
| Lane Drop | Freeway | Intercity Freight Corridor | 5,221,000 |
| Lane Drop | Arterial | Intercity Freight Corridor | 3,694,000 |
| Lane Drop | Arterial | Urban Freight Corridor | 1,665,000 |
| Lane Drop | Arterial | Truck Access Route | 41,000 |
| Lane Drop | Arterial | Intermodal Connector | 3,000 |
| | | Subtotal | 10,622,000‡ |
| | | Total | 243,032,000 |

Source: Cambridge Systematics.

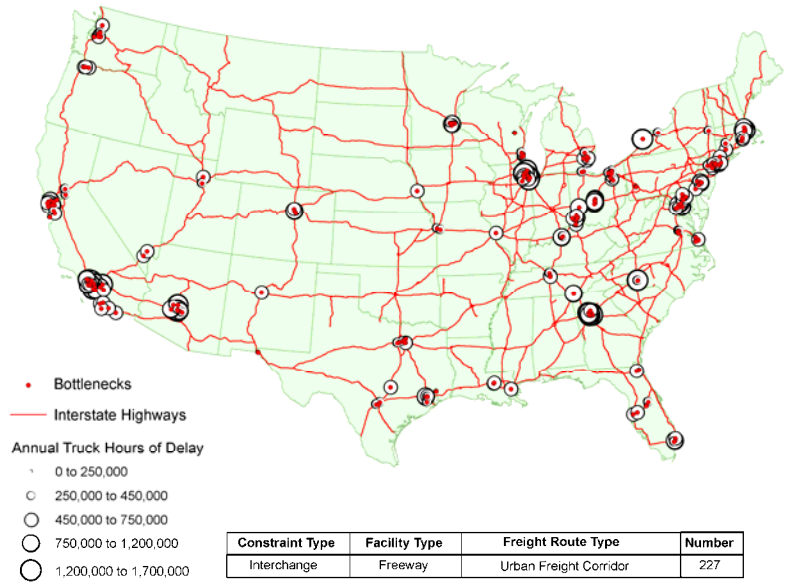
* The delay estimation methodology calculated delay resulting from queuing on the critically congested roadway of the interchange (as identified by the scan) and the immediately adjacent highway sections. Estimates of truck-hours of delay are based on two-way traffic volumes. However, the methodology did not calculate delay on the other roadway at the interchange. This means that truck-hours of delay were calculated on only one of the two intersecting highways or two of the four legs on a interchange, probably underreporting total delay at the interchange. The bottleneck delay estimation methodology also did not account for the effects of weaving and merging at interchanges, which aggravates delay, but could not be calculated from the available HPMS data. Estimates have been rounded to the nearest thousand.

‡ The HPMS sampling framework supports expansion of volume-based data from these sample sections to a national estimate, but does not support direct estimation of the number of bottlenecks. Estimates of truck-hours of delay are based on two-way traffic volumes. Estimates have been rounded to the nearest thousand.

The truck-hours of delay caused by individual highway interchange bottlenecks are significant. The top 10 highway interchange bottlenecks each cause an average of 1.5 million truck-hours of delay. Of the 227 highway interchange bottlenecks, 35 cause more than 1 million truck-hours of delay each; 103 more than 500,000 truck-hours of delay; and 173 more than 250,000 truck-hours of delay annually. Only a few dozen of all the other truck bottlenecks cause more than 250,000 truck-hours of delay annually.⁶ Exhibit 4 shows the distribution of truck-hours of delay for urban Interstate interchange bottlenecks. The top 25 interchange bottlenecks are described in the attachment to this testimony.

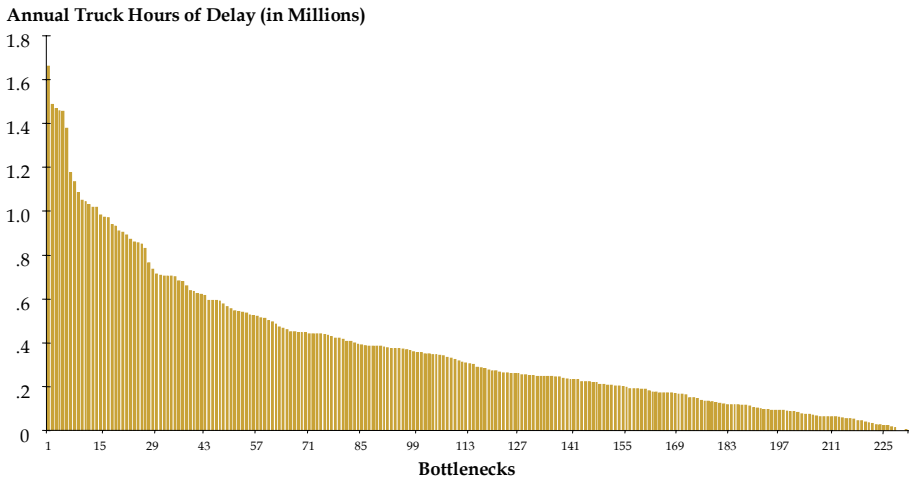
⁶ Twelve steep-grade bottlenecks, two signalized-intersection bottlenecks, and one lane-drop bottleneck accrued over 250,000 annual truck-hours of delay annually; however, the Highway Performance Monitoring System database has limited information to identify these types of bottlenecks, especially signalized-intersection bottlenecks.

Exhibit 3. Major Highway Interchange Bottlenecks for Trucks



Source: Cambridge Systematics, Inc.

Exhibit 4. Distribution of Truck-Hours of Delay for Urban Interstate Interchange Truck Bottlenecks, 2004.



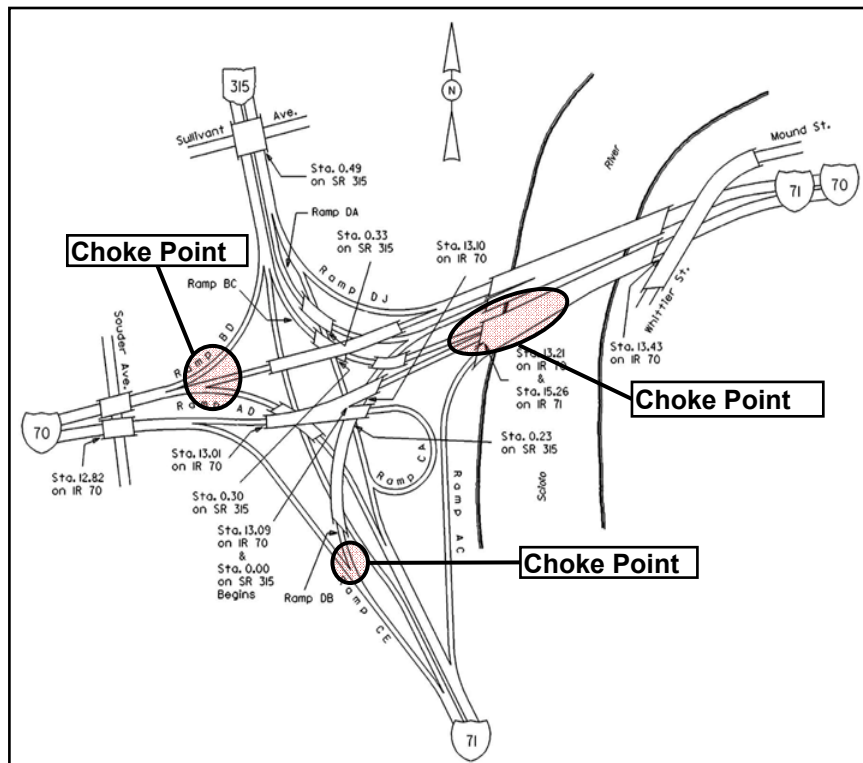
Source: Cambridge Systematics, based on FHWA Freight Analysis Framework data.

Working last year with the Ohio DOT, a Cambridge Systematics team led by another of my colleagues, Gary Maring, analyzed a set of major highway freight bottlenecks in Ohio.⁷

⁷ “Ohio Freight Mobility, Access, and Safety Strategies,” prepared by Cambridge Systematics, Inc. for the Ohio Department of Transportation, March 2006.

We identified specific choke points within the bottlenecks and estimated the type, value, and origins and destinations of the truck freight caught in them. Exhibit 5 shows the critical choke points within the Interstate 70, Interstate 71, and State Route 315 interchange in Columbus, Ohio. This interchange is one of three closely spaced bottlenecks along the I-70/I-71 corridor through downtown Columbus.

Exhibit 5. Columbus, Ohio I-70, I-71, SR-315 Bottleneck Critical Choke Points



Source: Cambridge Systematics, based on Ohio Department of Transportation data, 2005.

Strategies to Reduce Delay from Freight Bottlenecks on Highways

Bottlenecks such as the I-70/I-71 interchange in Columbus can be dissected and redesigned to reduce delays to truck and automobile drivers. The Ohio DOT estimates that selective redesign of portions of the I-70/I-71 corridor could eliminate upwards of 80 percent of the delays and crashes experienced today. The project would involve reconstruction of approximately 2 miles of the corridor, converting slopes to retaining walls, consolidating ramps, adding a new through lane in each direction, and using new frontage roads to collect and distribute traffic.

But they also found that less aggressive, more precisely tailored improvements such as redesign of a single ramp or repositioning of a weave or merge lane could cost-effectively reduce delays at some congested bottlenecks. Ohio DOT estimated that actions like these

could reduce the growth of congestion at major bottlenecks within the state from four percent annually to less than one percent annually.

Other strategies can be paired with engineering solutions to reduce delay. These include: traffic information services tailored specifically to truckers, especially long-haul truckers, to help them anticipate bottlenecks and route around them; much more aggressive incident management; addition of truck-only and truck-only-toll lanes; and expansion of intermodal rail service, especially medium-haul service (e.g., 300-500 miles). Our Ohio bottleneck study found that coordinated bottleneck improvements could be highly cost beneficial, generating significant user benefits as well as benefits to the state and regional economies.

Case for a Programmatic Approach to Freight Bottlenecks on Highways

While a few states such as Ohio are moving to address the problem of freight bottlenecks on highways, we do not have Federal policies and programs in place that recognize these bottlenecks as a national-scale problem that threatens to choke our highway freight system. We need to do so, and do so soon.

Bottlenecks at Interstate highway interchanges are a sizeable problem today, costing truckers alone \$4 billion annually. Bottlenecks will become a bigger problem in the future. Over the next 20 years, economic growth and trade will nearly double the tonnage of freight moved in the United States. This will translate into more shipments in more trucks traveling more miles. Between now and 2035, total truck-miles of travel are projected to increase at a rate averaging about 2.5 percent annually, with truck-miles of travel rising faster than automobile-miles of travel.⁸

Trucks will contribute to bottleneck congestion, but they will be heavily exposed to it as well. Trucking is the dominant freight transportation mode. According to the U.S. DOT's 2002 Commodity Flow Survey, trucks carried 67 percent of domestic shipments by tonnage, 74 percent by value, and 40 percent by ton-miles.⁹

When trucks are delayed by major highway bottlenecks, shipping costs go up and reliability drops across industry and retail supply chains. Businesses react by holding more inventory and passing the costs on to customers. The net effect is an erosion of competitive position in national and global markets, slower economic growth, and fewer jobs.

We need to take a national programmatic approach to highway bottlenecks because, while a relatively small number of bottlenecks account for large share of the delays and they are

⁸ U.S. Department of Transportation, Federal Highway Administration, *The Freight Story*, page 12, and recent estimates by Global Insight, Inc.

⁹ Bureau of Transportation Statistics and U.S. Census Bureau, "2002 Economic Census, Transportation, 2002 Commodity Flow Survey," Table 1b. Shipment Characteristics by Mode of Transportation for the United States: Percent of Total for 2002, 1997, and 1993.

widely scattered across the nation, they sit squarely on the cross-roads of our transcontinental and regional truck lanes. The solutions are site specific and expensive, especially in densely developed urban areas. Few states and cities can justify the cost and effort of fixing these bottlenecks alone. But the delays are felt nationwide.

We built the Interstate system to gain the benefits of interstate trade. We have been so successful that we risk choking on traffic congestion and losing the benefits of both interstate and global trade. We can now identify the critical bottlenecks to this trade, measure their costs to shippers and carriers, and target solutions. We must implement solutions at these nationally significant bottlenecks to improve freight productivity.

As you begin the process of reauthorization of the surface transportation legislation, I would encourage you to take a close look at the congestion on our nation's highway system, advance a national freight policy that recognizes bottlenecks as impediments to freight flows and trade, and focus programs such as the Interstate Highway program and the Projects of National and Regional Significance program on major highway freight bottlenecks.

Attachments

The attached exhibits list the top highway interchange bottlenecks for trucks. Exhibit A lists the top 25 interchange bottlenecks ranked by annual hours of delay for *all trucks*. Exhibit B lists the top 25 interchange bottlenecks ranked by annual hours of delay for *large trucks making trip greater than 500 miles*.

There is overlap between the tables, but the ranking by all trucks tends to flag interchanges in the nation's major freight hubs and trade gateways that serve high volumes of metropolitan and intercity truck traffic. The ranking by large trucks making trips greater than 500 miles tends to flag interchange bottlenecks that sit astride the key intersections of the nation's long-haul and transcontinental freight corridors.

In the tables, AADT is the abbreviation for Annual Average Daily Traffic, the number of vehicles, including automobiles and trucks of all sizes, traveling the critically congested roadway each day. AADTT is the abbreviation for Annual Average Daily Truck Traffic, the number of trucks of all sizes traveling the critically congested roadway each day.

A copy of the white paper, *Initial Assessment of Freight Bottlenecks on Highways*, is available at <http://www.fhwa.dot.gov/policy/otps/bottlenecks/bottlenecks.pdf>.

Exhibit A. Top 25 Highway Interchange Bottlenecks for Trucks
*Ranked By Annual Hours of Delay for All Trucks**

| Bottleneck | | | | 2004 | | | | | | | | | | | |
|---|-------------------------|--------------------------------|--------------|--------------|------------------------------------|------------|-------------------------|----------------------------------|---|-----------------------|-----------------------|-----------------------|------------------------|------------------------------|-----------------------|
| | | | | All Vehicles | | All Trucks | | | “Large Trucks Making Longer Distance Trips” | | | | | | |
| | | | | AADT | Daily Minutes of Delay per Vehicle | AADTT | Percent of All Vehicles | Annual Hours of Delay All Trucks | All Trips | | | | | Trips Greater Than 500 Miles | |
| Location | Urban Area | Critically Congested Route No. | No. of Lanes | | | | | | AADTT | Percent of All Trucks | Annual Hours of Delay | Annual Commodity Tons | Annual Commodity Value | Percent of Large Truck Trips | Annual Hours of Delay |
| I-90 @ I-290 | Buffalo-Niagara Falls | 90 | 4 | 136,500 | 8.3 | 33,100 | 24% | 1,661,900 | 7,300 | 22% | 367,000 | 2,632,500 | \$2,968,000 | 58% | 212,900 |
| I-285 @ I-85 Interchange (“Spaghetti Junction”) | Atlanta | 285 | 8 | 265,300 | 10.0 | 27,100 | 10% | 1,641,200 | 7,800 | 29% | 472,600 | 2,943,700 | \$3,262,000 | 52% | 245,800 |
| I-17 (Black Canyon Fwy): I-10 Interchange (the “Stack”) to Cactus | Phoenix | 17 | 6 | 217,300 | 9.2 | 28,900 | 13% | 1,608,500 | 9,000 | 31% | 501,600 | 3,326,700 | \$3,792,000 | 48% | 240,800 |
| I-90/94 @ I-290 Interchange (“Circle Interchange”) | Chicago-Northwestern IN | 90 | 8 | 305,800 | 9.7 | 26,300 | 9% | 1,544,900 | 9,200 | 35% | 540,400 | 3,718,000 | \$4,218,000 | 53% | 286,400 |
| San Bernardino Fwy | Los Angeles | 10 | 8 | 268,700 | 7.2 | 34,900 | 13% | 1,522,800 | 11,200 | 32% | 488,700 | 4,094,500 | \$4,780,000 | 31% | 151,500 |
| I-94 (Dan Ryan Expwy) @ I-90 Skyway Split (Southside) | Chicago-Northwestern IN | 94 | 8 | 271,700 | 7.9 | 31,600 | 12% | 1,512,900 | 11,100 | 35% | 531,500 | 4,485,900 | \$5,089,000 | 53% | 281,700 |
| I-285 @ I-75 Interchange | Atlanta | 285 | 6 | 226,300 | 9.6 | 25,700 | 11% | 1,497,300 | 7,400 | 29% | 431,500 | 2,792,800 | \$3,095,000 | 52% | 224,400 |
| SR 134 @ SR 2 Interchange | Los Angeles | 134 | 8 | 247,900 | 8.3 | 29,600 | 12% | 1,489,400 | 9,500 | 32% | 477,500 | 3,473,000 | \$4,054,000 | 31% | 148,000 |
| I-77 @ Tryon Rd | Charlotte | 77 | 6 | 170,500 | 8.3 | 29,600 | 17% | 1,487,100 | 7,300 | 25% | 367,000 | 2,700,200 | \$2,983,000 | 45% | 165,200 |
| Long Beach Fwy | Los Angeles | 710 | 8 | 246,100 | 8.3 | 27,500 | 11% | 1,380,300 | 8,800 | 32% | 442,400 | 3,217,100 | \$3,756,000 | 31% | 137,100 |
| I-20 @ I-285 Interchange | Atlanta | 20 | 6 | 187,200 | 8.3 | 27,000 | 14% | 1,359,400 | 7,800 | 29% | 392,100 | 2,943,700 | \$3,262,000 | 52% | 203,900 |
| I-80/I-94 split (Southside) | Chicago-Northwestern IN | 80 | 4 | 139,600 | 8.6 | 25,600 | 18% | 1,343,600 | 9,000 | 35% | 472,400 | 3,637,200 | \$4,127,000 | 53% | 250,400 |
| SR 60 @ I-605 Interchange | Los Angeles | 60 | 8 | 233,000 | 8.3 | 26,100 | 11% | 1,314,200 | 8,400 | 32% | 422,300 | 3,070,900 | \$3,585,000 | 31% | 130,900 |
| Pulaski Rd @ I-55 | Chicago-Northwestern IN | 55 | 6 | 197,200 | 7.5 | 28,700 | 15% | 1,300,400 | 10,000 | 35% | 453,700 | 4,041,300 | \$4,585,000 | 53% | 240,500 |

Exhibit A. Top 25 Highway Interchange Bottlenecks for Trucks (continued)
*Ranked By Annual Hours of Delay for All Trucks**

| Bottleneck | | | | 2004 | | | | | | | | | | | |
|---|-------------------------|--------------------------------|--------------|--------------|------------------------------------|------------|-------------------------|----------------------------------|---|-----------------------|-----------------------|-----------------------|------------------------|------------------------------|-----------------------|
| | | | | All Vehicles | | All Trucks | | | “Large Trucks Making Longer Distance Trips” | | | | | | |
| | | | | AADT | Daily Minutes of Delay per Vehicle | AADTT | Percent of All Vehicles | Annual Hours of Delay All Trucks | All Trips | | | | | Trips Greater Than 500 Miles | |
| Location | Urban Area | Critically Congested Route No. | No. of Lanes | | | | | | AADTT | Percent of All Trucks | Annual Hours of Delay | Annual Commodity Tons | Annual Commodity Value | Percent of Large Truck Trips | Annual Hours of Delay |
| I-75 @ I-85 Interchange | Atlanta | 75 | 10 | 339,600 | 9.1 | 23,400 | 7% | 1,288,800 | 6,800 | 29% | 374,900 | 2,566,300 | \$2,844,000 | 52% | 194,900 |
| I-93 @ I-95 Interchange | Boston | 93 | 6 | 188,400 | 8.3 | 25,500 | 14% | 1,280,100 | 2,800 | 11% | 140,800 | 1,020,000 | \$1,220,000 | 36% | 50,700 |
| I-290 @ I-355 | Chicago-Northwestern IN | 290 | 6 | 223,100 | 8.3 | 24,800 | 11% | 1,246,200 | 8,700 | 35% | 437,300 | 3,515,900 | \$3,989,000 | 53% | 231,800 |
| I-405 (San Diego Fwy) @ I-605 Interchange | Los Angeles | 405 | 10 | 331,700 | 9.8 | 20,900 | 6% | 1,245,500 | 6,700 | 32% | 398,600 | 2,449,400 | \$2,859,000 | 31% | 123,600 |
| I-80 @ Central St. | San Francisco-Oakland | 80 | 8 | 270,200 | 8.3 | 23,800 | 9% | 1,196,700 | 7,800 | 33% | 392,100 | 2,851,500 | \$3,329,000 | 29% | 113,700 |
| San Gabriel River Fwy | Los Angeles | 91 | 10 | 295,700 | 8.1 | 24,100 | 8% | 1,194,300 | 7,700 | 32% | 381,100 | 2,815,000 | \$3,286,000 | 31% | 118,100 |
| I-20 @ Fulton St. | Atlanta | 20 | 6 | 207,300 | 8.1 | 23,700 | 11% | 1,172,700 | 6,800 | 29% | 336,500 | 2,566,300 | \$2,844,000 | 52% | 175,000 |

* Annual Hours of Delay for All Trucks is the number of hours of delay accruing annually to all trucks delayed by congestion at the bottleneck (e.g., Daily Minutes of Delay per Vehicle multiplied by 2004 AADTT for All Trucks). Because the underlying Highway Performance Monitoring System data do not detail traffic counts by time of day, the actual number of trucks exposed to peak-period congestion is unknown, and therefore the reported truck hours of delay shown here provide good index to the relative impacts of the bottlenecks, but are not reliable absolute numbers.

Exhibit B. Top 25 Highway Interchange Bottlenecks for Trucks*Ranked By Annual Hours of Delay for Large Trucks Making Trips Longer Than 500 Miles**

| Bottleneck | | | | 2004 | | | | | | | | | | | |
|---|-------------------------|--------------------------------|--------------|--------------|------------------------------------|------------|-------------------------|----------------------------------|---|-----------------------|-----------------------|-----------------------|------------------------|------------------------------|-----------------------|
| | | | | All Vehicles | | All Trucks | | | “Large Trucks Making Longer Distance Trips” | | | | | | |
| | | | | AADT | Daily Minutes of Delay per Vehicle | AADTT | Percent of All Vehicles | Annual Hours of Delay All Trucks | All Trips | | | | | Trips Greater Than 500 Miles | |
| Location | Urban Area | Critically Congested Route No. | No. of Lanes | | | | | | AADTT | Percent of All Trucks | Annual Hours of Delay | Annual Commodity Tons | Annual Commodity Value | Percent of Large Truck Trips | Annual Hours of Delay |
| I-24 @ I-440N Interchange | Chattanooga (TN-GA) | 24 | 4 | 118,200 | 8.3 | 18,500 | 16% | 927,500 | 9,200 | 50% | 462,500 | 3,330,000 | \$3,750,000 | 85% | 393,100 |
| U.S. 95 @ I-15 Interchange (“Spaghetti Bowl”) | Las Vegas | 95 | 6 | 199,900 | 9.8 | 11,300 | 6% | 670,400 | 5,600 | 50% | 333,100 | 1,992,500 | \$2,286,000 | 90% | 299,800 |
| I-90/94 @ I-290 Interchange (“Circle Interchange”) | Chicago-Northwestern IN | 90 | 8 | 305,800 | 9.7 | 26,300 | 9% | 1,544,900 | 9,200 | 35% | 540,400 | 3,718,000 | \$4,218,000 | 53% | 286,400 |
| I-94 (Dan Ryan Expwy) @ I-90 Skyway Split (Southside) | Chicago-Northwestern IN | 94 | 8 | 271,700 | 7.9 | 31,600 | 12% | 1,512,900 | 11,100 | 35% | 531,500 | 4,485,900 | \$5,089,000 | 53% | 281,700 |
| I-75 @ I-74 Interchange | Cincinnati (OH-KY) | 75 | 6 | 193,100 | 9.7 | 19,200 | 10% | 1,128,900 | 6,900 | 36% | 405,300 | 2,735,200 | \$3,044,000 | 63% | 255,300 |
| I-10 @ I-110 Interchange | Baton Rouge | 10 | 6 | 150,400 | 7.2 | 15,200 | 10% | 665,000 | 8,600 | 57% | 375,200 | 3,163,900 | \$3,591,000 | 68% | 255,100 |
| I-80/I-94 split (Southside) | Chicago-Northwestern IN | 80 | 4 | 139,600 | 8.6 | 25,600 | 18% | 1,343,600 | 9,000 | 35% | 472,400 | 3,637,200 | \$4,127,000 | 53% | 250,400 |
| I-285 @ I-85 Interchange (“Spaghetti Junction”) | Atlanta | 285 | 8 | 265,300 | 10.0 | 27,100 | 10% | 1,641,200 | 7,800 | 29% | 472,600 | 2,943,700 | \$3,262,000 | 52% | 245,800 |
| I-17 (Black Canyon Fwy): I-10 Interchange (the “Stack”) to Cactus | Phoenix | 17 | 6 | 217,300 | 9.2 | 28,900 | 13% | 1,608,500 | 9,000 | 31% | 501,600 | 3,326,700 | \$3,792,000 | 48% | 240,800 |
| Pulaski Rd @ I-55 | Chicago-Northwestern IN | 55 | 6 | 197,200 | 7.5 | 28,700 | 15% | 1,300,400 | 10,000 | 35% | 453,700 | 4,041,300 | \$4,585,000 | 53% | 240,500 |
| I-290 @ I-355 | Chicago-Northwestern IN | 290 | 6 | 223,100 | 8.3 | 24,800 | 11% | 1,246,200 | 8,700 | 35% | 437,300 | 3,515,900 | \$3,989,000 | 53% | 231,800 |

Exhibit B. Top 25 Highway Interchange Bottlenecks for Trucks (continued)*Ranked By Annual Hours of Delay for Large Trucks Making Trips Longer Than 500 Miles**

| Bottleneck | | | | 2004 | | | | | | | | | | | |
|--|-------------------------|--------------------------------|--------------|--------------|------------------------------------|------------|-------------------------|----------------------------------|---|-----------------------|-----------------------|-----------------------|------------------------|------------------------------|-----------------------|
| | | | | All Vehicles | | All Trucks | | | “Large Trucks Making Longer Distance Trips” | | | | | | |
| | | | | AADT | Daily Minutes of Delay per Vehicle | AADTT | Percent of All Vehicles | Annual Hours of Delay All Trucks | All Trips | | | | | Trips Greater Than 500 Miles | |
| Location | Urban Area | Critically Congested Route No. | No. of Lanes | | | | | | AADTT | Percent of All Trucks | Annual Hours of Delay | Annual Commodity Tons | Annual Commodity Value | Percent of Large Truck Trips | Annual Hours of Delay |
| I-40 @ I-24 Interchange | Nashville | 40 | 4 | 147,600 | 8.3 | 14,600 | 10% | 735,200 | 5,800 | 40% | 291,600 | 2,099,300 | \$2,364,000 | 77% | 224,500 |
| I-285 @ I-75 Interchange | Atlanta | 285 | 6 | 226,300 | 9.6 | 25,700 | 11% | 1,497,300 | 7,400 | 29% | 431,500 | 2,792,800 | \$3,095,000 | 52% | 224,400 |
| I-35 @ Martin Luther King Jr. | Austin | 35 | 6 | 229,500 | 8.3 | 12,600 | 5% | 635,000 | 11,200 | 89% | 563,000 | 4,123,900 | \$4,768,000 | 39% | 219,600 |
| I-15 between Tropicana and Flamingo | Las Vegas | 15 | 6 | 165,900 | 6.4 | 12,400 | 7% | 486,700 | 6,200 | 50% | 242,800 | 2,206,000 | \$2,530,000 | 90% | 218,500 |
| I-12 @ Amite River, Baton Rouge | Baton Rouge | 12 | 4 | 105,000 | 6.4 | 14,400 | 14% | 561,900 | 8,100 | 57% | 317,200 | 2,980,000 | \$3,383,000 | 68% | 215,700 |
| I-75 @ U.S. 35 Interchange | Dayton | 75 | 4 | 127,400 | 8.3 | 18,400 | 14% | 923,100 | 7,900 | 43% | 397,100 | 3,131,600 | \$3,485,000 | 54% | 214,400 |
| I-90 @ I-290 | Buffalo-Niagara Falls | 90 | 4 | 136,500 | 8.3 | 33,100 | 24% | 1,661,900 | 7,300 | 22% | 367,000 | 2,632,500 | \$2,968,000 | 58% | 212,900 |
| I-20 @ I-285 Interchange | Atlanta | 20 | 6 | 187,200 | 8.3 | 27,000 | 14% | 1,359,400 | 7,800 | 29% | 392,100 | 2,943,700 | \$3,262,000 | 52% | 203,900 |
| I-75 @ I-85 Interchange | Atlanta | 75 | 10 | 339,600 | 9.1 | 23,400 | 7% | 1,288,800 | 6,800 | 29% | 374,900 | 2,566,300 | \$2,844,000 | 52% | 194,900 |
| I-264 @ I-64 Interchange | Louisville (KY-IN) | 264 | 6 | 181,100 | 8.3 | 16,400 | 9% | 825,500 | 5,400 | 33% | 271,400 | 1,990,200 | \$2,218,000 | 69% | 187,300 |
| I-55 (Stevenson Expwy) @ I-294 Interchange | Chicago-Northwestern IN | 55 | 6 | 172,600 | 9.6 | 17,200 | 10% | 1,001,600 | 6,000 | 35% | 349,900 | 2,424,800 | \$2,751,000 | 53% | 185,400 |
| I-80 @ I-480 Interchange | Omaha (NE-IA) | 80 | 5 | 173,600 | 7.9 | 13,800 | 8% | 658,500 | 4,500 | 32% | 215,500 | 1,638,000 | \$1,856,000 | 86% | 185,300 |
| I-76 @ SR 77 Interchange+J179 | Akron | 76 | 4 | 122,600 | 8.3 | 14,000 | 11% | 705,200 | 7,000 | 50% | 351,900 | 2,774,800 | \$3,088,000 | 52% | 183,000 |
| I-15 @ I-215 Interchange (the “Fishbowl”) | Las Vegas | 15 | 6 | 165,600 | 6.6 | 10,100 | 6% | 403,200 | 5,000 | 50% | 200,300 | 1,779,100 | \$2,041,000 | 90% | 180,300 |

* Annual Hours of Delay for All Trucks is the number of hours of delay accruing annually to all trucks delayed by congestion at the bottleneck (e.g., Daily Minutes of Delay per Vehicle multiplied by 2004 AADTT for All Trucks). Because the underlying Highway Performance Monitoring System data do not detail traffic counts by time of day, the actual number of trucks exposed to peak-period congestion is unknown, and therefore the reported truck hours of delay shown here provide good index to the relative impacts of the bottlenecks, but are not reliable absolute numbers.